# THE AMERICAN JOURNAL OF ROENTGENOLOGY

OFFICIAL ORGAN OF THE
AMERICAN ROENTGEN RAY SOCIETY

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VOLUME III NUMBER 8

August, 1916

PUBLISHED MONTHLY BY PAUL B. HOEBER
NEW YORK CITY

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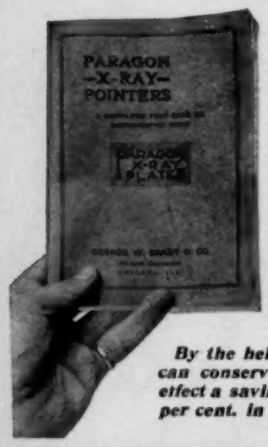


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THE AMERICAN JOURNAL OF ROENTGENOLOGY

*Editor, P. M. Hickey, M. D., Detroit*

VOL. III (NEW SERIES) AUGUST, 1916 No. 8

# SOME CAUSES OF ERROR IN THE ROENTGEN DIAGNOSIS OF BONE AND JOINT CONDITIONS*

BY ROLAND HAMMOND, M.D.

PROVIDENCE R. I.

SOME apology is needed in bringing before a Society of this character such a commonplace subject, the details of which should be thoroughly grounded in the training of every roentgenologist. I have been led to write this paper because of numerous errors which have come under my observation. These errors are not confined to any one section of the country nor to any class of workers. Most of them could have been avoided if the roentgenologist had possessed (1) an adequate knowledge of the laws of physics governing the roentgen rays; (2) a thorough knowledge of normal roentgen anatomy, and the many variations due to age and individuality.

It is a well-known fact that roentgen rays record their phenomena according to the atomic weight of the substances through which they pass. The rays pass through space in nearly parallel lines, and only the central rays may be said to strike the object squarely. Consequently there is likely to be much disproportion of shadows produced by the outer rays of the cone. Unless these simple facts are kept constantly in mind, we are always liable to error in our deductions, although the plates themselves reveal the true conditions.

The normal fat shadows below the patella are often diagnosed as villous arthritis, although the condition may be varied by using a high or a low tube. Undoubtedly a villous arthritis may be demonstrated on the roentgen plate, but we should be careful that we are not demonstrating shadows of normal structures.

Irregular thickening and shadows around the tuberosities of the os calcis are often diagnosed as gonorrheal in nature, although pathological proof is wanting. The same thickening is seen in conditions of hypertrophic arthritis of various joints, when the point of insertion of the tendo Achilles, the upper border of the patella and other points of tendinous insertion will often show similar shadows due to bony deposits.

I have seen a transverse line crossing the femur and extending for an inch or more into the muscular tissue as well, diagnosed as a fracture of the femur, although no other signs of fracture existed. This was plainly an artefact.

The necessity of standardization in the making of bone and joint plates was brought to the attention of this Society a few years ago by Hickey, and recently Case

* Read before the American Roentgen Ray Society at Atlantic City, September, 1915

has emphasized its importance. This lack of standardization is one of the most common causes of error in this work. The operator must make plates according to a standard which he has worked out for himself, or he must know the technic used in making a given plate, before he can read such plates accurately.

FIG. 1.—REMAINS OF EPIPHYSEAL LINE AT LOWER END OF RADIUS WHICH SHOULD NOT BE DIAGNOSED AS A HEALED FRACTURE. NORMAL WRIST.

A lack of knowledge of the normal in its many variations is, in my experience, the cause of the greatest number of erroneous diagnoses in roentgenologic work. While the normal epiphyseal line is now rarely diagnosed as a fracture, it is necessary to be familiar with appearance of the epiphyses at all ages and to remember that we see only that part of the epiphysis which is ossified enough to cast a shadow. It is well to remember that the vertebræ and the ilia have epiphyses. The location of the accessory bones and the sesamoids are well enough understood not to cause confusion in diagnosis. In case of suspected injury to the above structures nothing so clears the air as a plate of the normal area taken under similar conditions.

The variation in thickness of the cortex of the tibia is sometimes the cause of confusion as to whether or not a pathological process such as syphilis or osteitis deformans is present. If the two tibiæ are taken the confusion will often be dispelled.

The normal widening of the ulna and the fibula in the lower fourths of these bones, and of the radius and humerus in their middle thirds, should not be considered pathological unless other signs of abnormality exist.

At certain points, notably the outer portion of the head of the humerus, the olecranon depression of the humerus, the iliac fossa of the innominate bone, and the external malleolus, the bones are much thinner than the immediately surrounding bony structure. If these areas are the site of atrophy, such as occurs after injury or after long confinement in plaster of Paris, their normal thinning is much exaggerated and the condition may be diagnosed as pathological. The condition might be mistaken for a bone cyst, myeloid sarcoma, localized osteomyelitis (Brodie's abscess), or even tuberculosis.

The styloid process of the radius in a fairly large proportion of adults will show the remains of the epiphyseal line as a fine transverse line, extending from the inner two-thirds of the bone at the carpal surface to the outer border of the radius just above the tip. If the antero-posterior view happens to be taken in slight supination, the ridges bordering the grooves for the tendons of the extensor ossis metacarpi pollicis and the extensor brevis pollicis, will meet this transverse line in such a manner that a healed fracture of the lower end of the radius *may* be diagnosed. This has actually occurred in my experience, and a case is

now pending in court, having such a roentgen plate as its sole basis. (Fig. 1.)

The rim of the acetabulum is subject to great variation in width and thickness. In hypertrophic or senile arthritis of the hip-joint it is often increased in width and thickness, usually associated with similar changes in the head of the femur. The joint may show signs of arthritis on clinical examination, with no changes in the roentgen plate, because the process is confined to capsular changes. In such cases the roentgenologist should use great care in making his report. In one of the largest clinics in this country, I recently saw a case which was undoubtedly hypertrophic arthritis of the hip, from the clinical standpoint. The roentgen plate exhibited in connection with this case was reported to show slight hypertrophic changes, and yet nothing could be made out except the normal variation in the acetabular rim, which can be duplicated in thousands of normal hips.

A patient recently came to me with a diagnosis of bursitis in the region of the greater trochanter of the femur. He brought with him a very good roentgen plate of the hip made in a hospital in one of the largest cities in this country. Accompanying the plate was a drawing which the roentgenologist had thoughtfully made to elucidate the plate. The normal area of increased radiability situated in the lower portion of the greater trochanter at the site of attachment of the tendon of the gluteus minimus, was indicated in the drawing as the inflamed bursa. A bursa does occur at this place, and may be the subject of inflammation. The point I wish to make is that this roentgen plate did not show it, for the same light area is seen in the normal femur as well. (Fig. 2.)

The overlapping shadows of the carpal and tarsal bones often cause confusion to determine if injury has occurred or if arthritic disease be present. A comparative study of the normal area will usually suffice to settle the question of injury, and plates of other affected joints will demonstrate if arthritis is present elsewhere in the body.

One of the recent contributions to anatomical science is the transverse lumbar articulation of Dwight. The transverse process of the fifth lumbar vertebra is subject to great variation in size and width, and may at times form a broad articulating surface with the wing of the ilium. In making plates intended to show these transverse processes, care should be used

FIG. 2.—NORMAL AREA OF INCREASED RADIABILITY IN GREATER TROCHANTER OF FEMUR WHICH WAS ERRONEOUSLY DIAGNOSED AS A BURSA.

that the rays shall strike the vertebra at its middle; otherwise the shadow of the transverse process may be superimposed on that of the ilium and such an articulation be diagnosed.

Other sources of error might be mentioned, many of them learned through sad personal experience, but the above will serve to emphasize the points I wish to make: (1) that we should always keep in mind the laws of physics governing the roentgen rays; (2) that a thorough knowledge of normal roentgen anatomy is essential to the proper interpretation of bone and joint plates.

# THE RADIOGRAPHIC EFFICIENCY OF THE COOLIDGE X-RAY TUBE

BY W. S. GORTON, PH.D., AND J. A. C. COLSTON, M.D.

(FROM THE JAMES BUCHANAN BRADY UROLOGICAL INSTITUTE, JOHNS HOPKINS HOSPITAL)

BALTIMORE, M.D.

THE field of usefulness of the Coolidge *x*-ray tube has been largely confined to treatment work. In view of the great steadiness and reliability of this source of *x*-rays, one might have anticipated that it would find extensive use in radiography, but such has not been the case. The statement generally made by those who have used it is that it does not give as good pictures as does the ordinary form of *x*-ray tube, and the reason, if any, assigned for this state of affairs has been the broadness of the focus of the Coolidge tube. In spite of this unfavorable verdict it seemed worth while, in view of the advantages offered by the Coolidge tube, to make a thorough investigation of its radiographic properties in order to determine precisely its efficiency as a radiographic agent, and also in the hope that a method of manipulation might be found which would place it on a par with the ordinary type of tube for radiographic purposes.

The apparatus used was a 10-K.W. transformer, a 7-inch tube of the ordinary type with a tungsten target, and a Coolidge tube of the medium focus type. This type was used instead of the fine focus type because the tube had been purchased previously for both radiographic and treatment purposes.

The field of work was limited to the kidney, as this is the region with which the work of the Brady Institute is principally concerned. Besides, pyelography is a difficult branch of radiography, and if it should be found that the Coolidge tube is suited to pyelography then it certainly should be suitable for less deep-lying structures.

The plan of the work comprised exposures with the Coolidge tube on patients of various thicknesses under various conditions of current, spark-gap, and time of exposure, with and without a compression diaphragm, and with and without an intensifying screen; also some exposures with the ordinary type of tube under various conditions. The pictures, for the most part, were plain kidney pictures. It is well known that a picture which may be expected to show kidney stone has certain well-known characteristics, notably the presence on the plate of the shadows of the spinous processes of the lumbar vertebræ and of the psoas muscles. These characteristics were the criteria in the examination of the plates. The Coolidge tube was also used in a few instances with the pelves of the kidneys injected with thorium solution.

A prime requisite in this work was a table giving the relation (for any one value of the spark-gap) between the thickness of the patient in inches and the amount of the exposure in milliampere-seconds. Such a table was a vital necessity because it was, of course, impossible to make more than a few exposures on one patient. Numerous patients were necessary, and they had to be taken as they came, of various thicknesses. Experiments on the absorption of *x*-rays give us the basis for such a table. It has been shown that any layer of a certain thickness in a homogeneous absorbing body absorbs a given proportion of the *x*-rays of a definite hardness incident upon it irrespective of its distance from the surface of the body. From this law it can easily be shown that if the thicknesses of a series of bodies are, say, 6, 7, 8, etc., or, equally well, 3, 4, 5, etc., then the necessary exposures will be proportional to 1, $n$, $n^2$, etc. In the actual case of the radiography of the human body

the above relation applies only approximately, as the body is not homogeneous, nor are the $x$-rays all of one degree of hardness; but it applies closely enough to be of very great assistance. This is particularly the case if the rays come from a hard tube. Such rays are more nearly homogeneous than those from a soft tube. All that is needed to set up such a table is to find the correct exposures for two persons of different thicknesses, after which it is a simple matter of calculation to find the exposure for any thickness. The table, of course, can be modified to advantage from the results of experience.

An example of such a table is given as follows:

TABLE

4-inch spark-gap; no intensifying screen.

| Thickness of patient in inches | Exposure in milliampere-seconds |
|---|---|
| 5 | 300 |
| 6 | 420 |
| 7 | 590 |
| 8 | 830 |
| 9 | 1160 |

The matter of the spark-gap received considerable attention in the present work. In most $x$-ray work it is customary to test the tube at a small value of current through it and adjust the spark-gap to a certain value, then to advance the rheostat handle to a suitable position and make the exposure. During the exposure the spark-gap increases anywhere from 1 to 3 inches, depending upon the condition of the tube. This is shown by the spark-gap meter, and can be verified by the use of the spark-gap itself. The result of this procedure is that the spark-gap, during the exposure, is an uncertain quantity. Now it has been shown that the quality of a beam of $x$-rays is determined very largely by the maximum value of the voltage applied to the tube, and it is this maximum value that is shown by the spark-gap. Consequently it is of great importance to know the actual value of the spark-gap during an exposure. In the present work, this quantity was always determined by testing the tube using the same values of current and spark-gap as were subsequently used during the actual exposure. All values of the spark-gap given in this paper are actual values of the spark-gap during exposure as determined above.

A 4-inch spark-gap was used during most of the work. This value was a compromise between larger values which require a shorter exposure, but give less contrast and smaller values which give greater contrast, but require longer exposures. Both larger and smaller values of the spark-gap, however, were tried. The current through the Coolidge tube was generally about 40 milliamperes; the design of the transformer for heating the cathode did not permit a larger current to be obtained safely.

The work with the Coolidge tube was subject to many of the uncertainties which beset work with the ordinary type of tube. Patients of the same thickness were found to vary greatly in their opacity to the $x$-rays and, as a consequence, the table above referred to required considerable judgment in its use. The transformer apparatus, which was supplied with alternating current, had an annoying habit of changing its adjustment or even reversing polarity without the slightest warning. But these uncertainties are likewise the lot of the ordinary type of tube. The net result is to make the Coolidge tube far simpler to manipulate.

The outstanding result of the work is that on the average the Coolidge tube gives as good pictures as does the ordinary type of tube used heretofore. The best pictures obtained from the Coolidge tube are not quite as good as the best obtained from the ordinary tube, but the difference is very small. The Coolidge tube used in the present work was of the medium focus type, but the pictures obtained by means of it did not seem to be inferior in sharpness to those obtained with the ordinary tube. Better pictures were obtained with the use of a compression diaphragm than without one, and better results without an intensifying screen than with one. A surprising feature of the work was the amount of time required

for the exposures. For the same value of spark-gap and current through the tube, the Coolidge tube was found to require an exposure from two to three times as long as that required by the ordinary type of tube. This means that the ordinary tube under the conditions specified gives out a far larger quantity of *x*-rays than does the Coolidge tube. This does not mean that the Coolidge tube is less efficient as a producer of *x*-rays; the condition is almost certainly due to the characteristics of the milliammeter. This instrument indicates an average value of all the instantaneous values assumed by the current. Now in the Coolidge tube the current cannot increase more than a certain amount whereas in the ordinary tube there is a rough proportionality between the current and the voltage. The result is that in the ordinary tube a larger proportion of the current passes when the voltage on the tube is high, thus producing a greater quantity of *x*-rays than is the case when the current has a limiting value.

The results of the present work may be summarized by saying that the Coolidge tube gives as good results as does the ordinary type of tube with much simpler manipulation, but at the cost of an increased exposure.

# A PLEA FOR CONSERVATISM IN THE TREATMENT OF CLOSED FRACTURES FROM A ROENTGENOLOGICAL STANDPOINT *

## DEMONSTRATION OF END RESULTS

BY SAMUEL B. CHILDS, M.D.

Professor of Roentgenology, Medical Department, University of Colorado

DENVER, COLO.

THE brilliant results achieved by operative surgery in the past decade are marvelous, and no part of the body has failed to contribute some share to this glory. Naturally, success following operations upon one part of the body after another, has prompted surgeons to try new fields and the treatment of closed fractures by open operation has been only a sequence in the advancement of surgical science.

The roentgenologist has probably been a factor in the greatly increased number of operations on closed fractures in the past few years, if not by his own advice, at least by making examinations from which unwarranted conclusions as to the necessity of an operation have been drawn by the surgeon.

It seems high time that the roentgenologist, from years of experience in the examination of recent fractures and in the demonstration of end results in cases of fracture, where there has not been complete apposition of the fragments, should place himself squarely against the wholesale and indiscriminate operations upon closed fractures that are being done daily throughout the country.

Patients are referred to the roentgenologist by the physician or surgeon not only for a diagnosis, but also for consultation as to the appropriate method of treatment, and if we have failed to fit ourselves as consultants, we have lowered the standard of roentgenology and reduced ourselves to mechanicians or "picture takers."

* Read at the 16th Annual Meeting of the American Roentgen Ray Society, Atlantic City, Sept. 22-25, 1915.

The closed fracture cases that are referred to us can readily be divided into at least five classes:

1. Fractures that are either in perfect apposition or in such good anatomical position that proper fixation is all that is indicated.

2. Fractures that are neither in good alignment nor apposition and in which further attempts at reduction should be made.

3. The fractures just mentioned under the second heading in which, after one or more attempts to improve the faulty position of the fragment, the patient having been anesthetized and the surgeon guided in his manipulations by the fluoroscope and all the means at our disposal, faulty position persists.

4. Fractures where a combination of circumstances or individual idiosyncrasy seems to indicate an operation, without any previous attempt at reduction by external manipulation. Such a condition is rare, however.

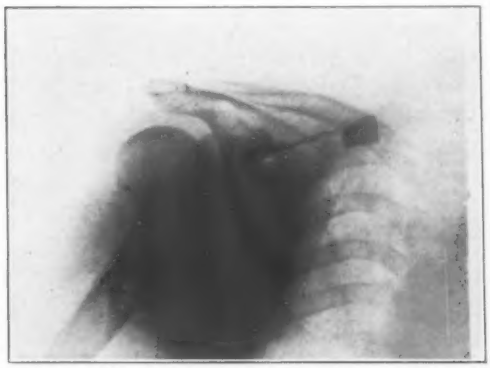

FIG. 1.—IMPACTED FRACTURE OF THE SURGICAL NECK OF THE LEFT HUMERUS.

Marked displacement toward the axilla at point of impaction, with external rotation of the head, so that practically the greater part of its articular surface is not in contact with the glenoid cavity.

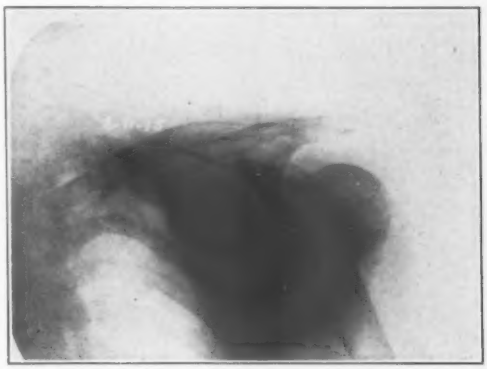

FIG. 2.—SAME CASE AS SHOWN IN FIG. 1. AFTER SIX MONTHS. COMPLETE UNION.

FIG. 3.—RARE FRACTURE OF LOWER AND ANTERIOR PART OF TIBIA, WITH MARKED DISPLACEMENT OF FRACTURE; ALSO FRACTURE OF FIBULA.

Operation advised by surgeon but refused. Final adjustment.

FIG. 4.—SHOWING WHAT NATURE CAN DO IN THE REPAIR OF A COMPLETELY MISPLACED FRAGMENT IN THE LOWER THIRD OF THE HUMERUS.

5. Old ununited fractures.

In the writer's roentgenological experience with fractures during the past fifteen years, he has been particularly impressed with the fact that in a number of cases, in which either deformity or impaired functional result seemed inevitable, the patients

have recovered without much, if any, apparent deformity and with a good functional result. The roentgenological examinations of the end results in these cases have been equally astonishing. Nature has smoothed and shaped the callus, rounded and absorbed many, if not all, of the sharp projecting ends and molded the mass consisting of callus, poorly aligned fracture ends or fragments, into a smooth homogeneous bony mass, approximating the caliber and shape of the normal bone, above all, reinforcing the callus to maintain as nearly as possible the correct axis of the bone.

FIG. 5.—EXTENSIVE COMMINUTION OF THE LOWER END OF THE TIBIA AND FIBULA. FINAL ADJUSTMENT.

FIG. 6.—SAME CASE AS SHOWN IN FIG. 5, WITH GOOD UNION AND ABILITY TO WALK ON FOOT FAIRLY WELL. PLATE MADE 18 MONTHS AFTER INJURY.

This experience has prompted the writer to demonstrate the roentgenological results, in some of these cases, and let them speak for themselves; they show the capabilities of nature as a plastic surgeon better than words can describe. While it is realized that the same result may not be duplicated in a similar case and correct deductions cannot be made from a few astonishing results, yet the chances of obtaining a satisfactory result in the great majority of such cases without an operation are believed to be as good, or even better, than by an open operation, with the risk of an infection, especially when the operation is performed by a surgeon not aware of the scrupulous asepsis and care required in these cases. We have seen, following the open operation in fractures, too many cases of infection with its frequent terrible sequences of necrosis, osteo-myelitis, often necessitating an amputation of the limb and occasionally causing the death of the patient, not to realize the danger that may attend the operative treatment. In a number of the cases shown, an operation was advised, but was refused either by the patient or some member of the patient's family.

Based upon the writer's roentgenological experience with over seven thousand cases of fractures, the following conclusions seem warranted:

1. Perfect apposition or alignment of a fracture is not necessary to obtain a good anatomical or functional result, or both.

2. With fair alignment in a fracture, although some anteroposterior or lateral displacement exists, preferably not to exceed one-half the diameter of the shaft of a weight-bearing long bone, a good functional result can be expected, but a longer time for union must be anticipated.

3. In Pott's and Colles' fractures, a proper alignment of the axis of the shaft of the tibia to the astragalus, and the axis of the shaft of the radius to the space between the second and third metacarpals, although the ends of fragments of the fracture are not in close apposition, will probably give a good anatomical and functional result. It must not be forgotten, however, in these fractures as well as in a fracture

in any part of the body, especially in the neighborhood of a joint, that the damage done to the soft parts at the time of the injury is often an important factor in the failure to obtain a good functional result.

4. In cases where doubt exists as to the probability of obtaining a good functional result in a fracture, provided the displacement of the axis of the shaft of the bone or the fragments is not too great, the patient or the family should be acquainted with the facts, and told that the chances of success in obtaining a good result in a series of similar cases without an operation will be about ninety per cent., but if failure results a subsequent operation can often be performed with equally good prospects of success, as if done in the recent fracture. Their wishes or decision in the matter should be given due consideration.

5. Care should be exercised to inform the patients that occasionally non-union results from some constitutional condition, or unknown cause, although the ends of the fracture are in good position. This is particularly true in fractures of the neck of the femur, in elderly people.

6. A certain small proportion of closed fractures, probably less than ten per cent., require an open operation for proper fixation of the fragments. These cases should be carefully selected and an operation decided upon only after the attending physician or surgeon has satisfied himself that a sufficiently good alignment of the shaft or fragments can not be maintained by external fixation, to warrant the assumption that a good result can be expected.

7. Ununited fractures after six to eight weeks, in which deficient callus formation

FIG. 7.—SUPRA-CONDYLOID FRACTURE IN A TEAMSTER ABOUT 50 YEARS OF AGE.
Lateral view, final adjustment.

is apparent, should be treated constitutionally if indication therefor exists, and the patients should be encouraged to use the limb, with adequate ambulatory splint, or other local treatment instituted, before an immediate operation is advised. In many of these cases following these procedures, solid bony union will result in a comparatively short time.

# X-RAY LOCALIZATION OF FOREIGN BODIES IN THE EYE BY THE SWEET METHOD *

BY JOHN S. DERR, M.D.
Roentgenologist to the Wesley House
ATLANTA, GA.

WHEN there is a question of an injury to the eye by a foreign body, it is a matter of the greatest importance to determine whether or not there is a foreign substance in the globe, and if so, to resort to the best means of removing it. Even if the vision in the injured eye cannot be preserved, by the timely removal of the foreign body, the eye ball itself may be saved, which is much better than a glass one, and also the danger of delayed inflammation, and sympathetic ophthalmia be removed.

Of course it is possible that a foreign

*Read before the Fulton County Medical Society.

body in the vitreous or even in the ciliary body may become encysted and give no trouble, but I am led to believe that this is a rare exception and that such a body retained within the eye ball ultimately means a destroyed eye and danger to its fellow. For this reason no means should be neglected to determine the presence or absence of such a body. The ball may be quite severely injured, the globe punctured, lens dislocated and ciliary body torn without any foreign body being present, and on the other hand, as emphasized by a case which was referred to me, the injury at the time was so slight, as hardly to attract attention, and still the body was found to be present.

As Dr. William Sweet, of Philadelphia, has demonstrated by the examination of a large number of cases, presented in several exhaustive articles, there is no agent for detecting the presence of foreign bodies, which compares with the roentgen rays, skillfully applied. Other agents mentioned by him are the sideroscope which detects the presence of iron and steel, but fails on all non-magnetic substances such as copper, stone, glass and the alloys.

The same may be said of the giant magnet, as a test by the pain reaction. But this gives no idea of the location of the body except in the iris, and great harm may be done to the delicate structure of the eye if this force is applied in the wrong direction.

Regarding the size of a foreign body, that it is possible to show on the *x*-ray plate I will quote what Dr. Sweet says on this subject:

"It is conceivable that a metallic body may be so small that the shadow cast on the plate cannot be recognized, but I believe that a splinter of metal that is of sufficient size to strike and penetrate the coats of the eye ball will be of sufficient density to cast a shadow on the photographic plate."

I have certainly seen such bodies which appeared hardly bigger than a pin point and which took considerable care to keep from losing them after extraction.

In my small series of sixteen cases in which Dr. Sweet's method of localization has been used, I think its efficiency has been conclusively demonstrated to myself and I think also to those specialists to whom I am indebted for the cases.

The general principles of the method are expressed most concisely by Dr. Sweet himself as follows:

"All methods of localization that can lay claim to accuracy are based on the triangulation of the planes of shadows of the foreign body at two exposures with the tube in different positions, and studied in relation to the shadows cast, by one or more known points of known position near the eye ball."

By practical application of this principle rendered possible by Dr. Sweet's apparatus and the chart of the diagramatic eye, it is possible to locate a foreign body accurately in millimeters within the eye ball.

Although the chart works out quite simply once the exposures are made, still the most important part is left to the operator, as the accurate adjustment of the apparatus and making the measurements is of prime importance, and no rifleman making a long shot has to line up his sights more carefully than has the radiologist to adjust the sights of the localizer on the apex of the cornea. The instrument used by me is Dr. Bowen's modification of the Sweet apparatus. It consists of an aluminum covered platform about 8 x 10 inches and rests on legs of convenient height to bring the head on a level, when the patient lies on his side on the table using the platform as a pillow. A small air cushion makes this more comfortable. The platform consists of a sliding plate holder by means of which two exposures can be made on one 5 x 7 plate.

The head is carefully leveled, the patient lying on the affected side, and the eye is adjusted to a diagram on the platform. The padded clamp is then applied which holds the patient's head firmly on the air cushion and the localizer is then adjusted. This consists of two vertical parallel rods about two and one half inches long. Fastened to the end of the upper rod is a

little brass ball, on the lower one a cone. They are separated about twelve mm. or so, so that when the ball is focused on the center of the cornea, the cone will correspond to the periphery of the eye ball. The patient is now directed to open his eyes wide and fix his gaze on a fixed point immediately in front of him. The ball of the localizer is then sighted on the cornea and the patient directed to close his lids. The localizer is then moved up to the lid, until the ball sinks into it approximately its own thickness, or until the patient feels pressure on the ball. A spring is then touched and the localizer jumps back 10 mm. The tube with a small diaphragm is now focused immediately over the eye and localizer so that the shadows of the rods will coincide.

The first exposure of 2 to 3 seconds is now made. The plate is then shifted in its holder and the tube tilted parallel to the patient's body so the rods of the localizer will cast separate shadows.

The plate having been prepared, the relations of the ball and cone to the foreign body are studied and the measurements made on the chart.

Sometimes it happens from the explosion of a cap, or injury from a shot gun, that the entire field is filled with shadows of fragments of metal, some of which may be on the side opposite to the injured eye. These latter will be recognized, from the less distinct and clear cut outline and some which may appear to be in the globe from the lateral view may be simply in the superficial tissues external to the orbit. The shadows of fragments likely to be in the eye ball should be picked out and localized.

Of course it is always a good idea to determine first by a lateral exposure whether or not a foreign body is present, which may save going through this procedure.

The only possible source of error in this method when accurately carried out, is the possible variation in the size of the patient's eye from that of the diagrammatic eye which is 24 x 25 mm., but this is so slight as to be negligible. By this means the exact position of the body may be mapped out though the vitreous may be filled with blood, or the cornea so opaque as to render the ophthalmoscopic view entirely unsatisfactory.

It has also been shown that the position of the wound in the cornea or sclera is no indication of the situation of the foreign body in the ball. Unless buried in the ciliary body or the coats of the eye, metal bodies will have a tendency to gravitate to the lower part of the ball.

In the following reports of cases I have not included those which were negative for foreign bodies. In those cases which came to operation for removal or enucleation so far as I have been able to determine, the *x*-ray localization of the bodies was correct.

To summarize, of the sixteen cases reported, there was only one female. Seven were cases of injury to the right eye, and nine to the left. In eleven of these the foreign bodies were successfully removed; one had caused absorption of the lens, another was removed from the orbit. In two, the eye had to be enucleated after the operation. In two the foreign body was not removed, and one was enucleated before removal.

In closing I wish to express my gratitude to the friends who have sent me these cases.

### REPORTS OF CASES

*Case 1.*—Male, age 34. Referred by Dr. Calhoun, Dec. 21, 1911. Patient was using a hammer and chisel on a pipe when a fragment flew off and struck him in the left eye.

The shadow indicating a thin sliver of metal was located in several plates, 8 mm. behind the center of the cornea and 8 mm. below the horizontal plane.

It was removed by Dr. Calhoun by the electro-magnet.

*Case 2.*—Male, age 19. Referred by Dr. Calhoun, Jan. 24, 1912. Injury to the right eye by fragment of metal. Shadow on the *x*-ray plate measured 2 x 1 mm. The localization showed it to be 21 mm. back

of center of cornea, 10 mm. below the horizontal plane, 3 mm. to the temporal side.

The body proved not to be magnetic and not removed.

*Case 3.*—Male, age 17. Referred by Dr. Calhoun, Jan. 7, 1912. While driving rivets in a boiler shop, patient was struck in the left eye ball after which his vision became much clouded.

Foreign body removed measuring 2 x 3 mm.,
Localized 11 mm. back of center of cornea,
7 mm. below horizontal plane,
5 mm. to temporal side.

FIG. 1.—PATIENT, A. C. L., AGE 13. REFERRED BY DR. ROY.

| | |
|---|---|
| Size of foreign body (No. 4 shot) | 3 x 3mm. |
| Back of cornea | 14.5 mm. |
| Below horizontal plane | 10 mm. |
| To nasal side | 8 mm. |

Owing to severe inflammation the eye ball had to be removed.

*Case 4.*—Male, age 24. Referred by Dr. Roy, June 17, 1913. While working with a hammer and chisel a piece of steel flew off and struck him in the left eye.

The body measured 3 x 1 mm., and was localized as follows:

10 mm. behind cornea,
25 mm. below the horizontal plane,
6 mm. to temporal side.

An incision was made in the sclera in the region indicated by the localization and the introduction of a small electromagnet promptly removed the body.

*Case 5.*—Male, age 13. Referred by Dr. Roy, Jan. 15, 1914. Patient was struck in the left eye by a shot which penetrated the tissues at the outer canthus. Vision remained good for three weeks or more and then got cloudy until only perception of light remained.

A No. 4 shot 3 mm. was localized:

14.5 mm. back of cornea,
10 mm. below the horizontal plane,
8 mm. to the nasal side.

The eye ball was removed and the shot found imbedded in the coats of the ball and bulging the sclera in the lower internal quadrant of the eye.

*Case 6.*—Male, age 31. Referred by Dr. Calhoun, Jan. 22, 1914. One week previous while working on a saw, patient was struck in the left eye by a fragment.

Foreign body 1½ x ¾ mm. localized:

5 mm. behind cornea,
3 mm. above horizontal plane,
4 mm. to temporal side.

This was successfully removed by the aid of the electromagnet.

*Case 7.*—Male, age 21. Referred by Dr. Lokey, June 4, 1915. Patient was struck in the left eye by a fragment of steel from a hammer.

Foreign body, 1.5 x 1 mm.,
Localized, 10.5 mm. behind cornea,
1 mm. below the horizontal plane,
9 mm. to the nasal side.

It was successfully removed by the electromagnet.

*Case 8.*—Male, age 47. Referred by Dr. Stirling. Patient was struck in the eye a few days before by a piece of steel from a hammer.

Foreign body, 6 x 5 mm.,
Localized, 19 mm.,
3 mm. above horizontal plane,
2 mm. to the nasal side.

An incision was made in the sclera and as far back as possible and the body successfully removed by a small electromagnet introduced into the vitreous.

*Case 9.*—Male, age 30. Referred by Dr. Calhoun, April 8, 1914. Patient was struck in the right eye by a fragment following the explosion of a dynamite cap. The wound was below and to the outer side of the cornea, and the body was thought to be in the neighborhood of the lens.

No inflammation present but vision is bad.

In two sets of exposures made, a considerable number of small shadows were found scattered about the orbital region. Most of them evidently not in the ball. One was picked out and localized as follows:

Size, 5 x 5 mm. in the horizontal plane,
7.5 mm.behind the cornea,
3 mm. to temporal side.

This body was successfully removed by Dr. Calhoun.

*Case 10.*—Male, age 33. Referred by Dr. Lokey, Jan. 23, 1914. While working on an anvil, patient was struck in the right eye by a fragment of metal near the outer side of the cornea.

Size of body, 1 x 2.5 mm.,
13.5 mm. back of cornea,
2.5 mm. below the horizontal plane,
7 mm. to temporal side.

Foreign body was not removed.

*Case 11.*—Male, age 18. Referred by Dr. Lokey, May 6, 1914. Patient while grinding a chisel on an emery wheel got some dust in his right eye he thinks, but he did not notice it until next morning.

His physician was unable to locate anything, but later opacity of the lens began to develop, and he was seen by several consultants, one of whom suggested that an *x*-ray examination be made. I neglected to mention that he had been given antisyphilitic treatment also, in effort to clear up the condition.

The *x*-ray plates showed a long thin foreign body in a vertical position.

Foreign body, 6 x 5 mm.,
Localized, 5 mm. behind the cornea,
2 mm. below the horizontal plane,
3 mm. to the nasal side.

There was no reaction to the electromagnet. Ophthalmoscope failed to show any body.

This localization would throw its position in the lens. Later at operation the lens was found completely dissolved, and a minute piece of copper wire was found corresponding exactly to the *x*-ray shadow.

*Case 12.*—Male, age 21. Referred by Dr. Calhoun, Dec. 3, 1914. Patient was struck in the right eye by a fragment, while using a hammer and chisel. It was seen in the globe with the ophthalmoscope, but not definitely located.

Size of foreign body, 1.5 mm.,
Localized, 21 mm. behind the cornea,
6 mm. below horizontal plane,
3 mm. to temporal side.

The body was drawn into the anterior chamber with a giant magnet, and removed through a slit in the limbus.

*Case 13.*—Female, age 18. Referred by Dr. Roy, Jan. 3, 1915. Patient was struck in the internal canthus of the right eye by a B. B. shot from an air gun the shot

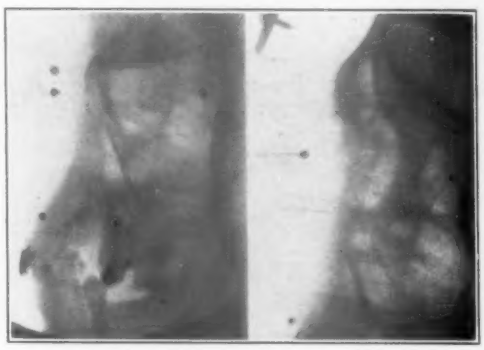

FIG. 2.—SHOT LOCATED BEHIND THE GLOBE.

penetrating the wire screen door against which she was leaning. There was bleeding and much pain and swelling followed, but as a shot was found on the floor near by it was not certain that it had penetrated the eye.

| | | |
|---|---|---|
| The plate showed the shot, | 5 x 5 | mm., |
| Behind the cornea, | 19 | mm., |
| Below the horizontal plane, | 5 | mm., |
| To nasal side of plane, | 13 | mm. |

This would throw the body 3 mm. to the nasal side of the ball in the orbital cavity, from which location it was removed by Dr. Roy shortly after.

*Case 14.*—Male, age 20. Referred by Dr. Calhoun, Feb. 26, 1914. While working in a machine shop patient was struck in the left eye by a fragment of metal. Examination showed a definite wound in front of the cornea.

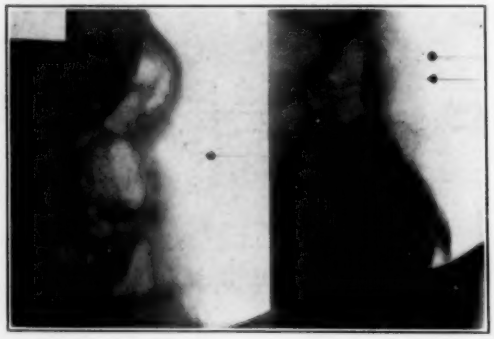

FIG. 3.—PATIENT, H. G., AGE 20. REFERRED BY DR. CALHOUN. CASE 14.

| | | |
|---|---|---|
| Foreign body, | 4 x 1 | mm., |
| Back of cornea, | 8 | mm., |
| Below horizontal plane, | 7 | mm., |
| To temporal side, | 3 | mm. |

Dr. Calhoun removed this with the electromagnet the same afternoon.

*Case 15.*—Male, age 50. Referred by Dr. Lokey, March 12, 1915. Patient was struck in the left eye by a fragment of steel while drilling a file.

| | | |
|---|---|---|
| Size of foreign body, | 1 x 1.4 | mm., |
| Back of cornea, | 16 | mm., |
| To temporal side, | 10.5 | mm., |
| In the horizontal plane. | | |

The globe had to be finally removed on account of beginning of sympathetic ophthalmia, and a very minute body was found in the vitreous at the point indicated in the localization.

*Case 16.*—Male, age 34. Referred by Dr. Grubb, Richland, Ga. While watching some work on the driving shaft of his auto, patient was struck in the eye by a fragment of steel.

| | | |
|---|---|---|
| Size of foreign body, | 3 x 1 | mm., |
| Behind cornea, | 8 | mm., |
| Above horizontal plane, | 4.5 | mm., |
| To nasal side, | 2 | mm. |

This was successfully removed from behind the lens, but the eye went bad and had to be removed.

BIBLIOGRAPHY

"The Localization of Foreign Bodies in the Eye," by William M. Sweet, M.D., Philadelphia.

"Results of X-Ray Diagnosis and of Operations in Injuries from Foreign Bodies," by William M. Sweet, M.D., Philadelphia.

## A MINOR OPERATION

Up to the Hospital there came
  A maid of scarcely three,
And she was lame, unhappy child!
  A sorry sight to see!

She wept. Her mother's face was drear—
  To abbreviate the story,
They found themselves escorted to
  The X-ray Lab'ratory.

A skiagram was quickly made—
  The little bones lay true;
The doctor mused a space, and said:
  "Pray, let me see her shoe."

A gentle smile illumed his eyes,
  Softly he murmured, "So?"
And with his finger he removed
  Some Toffee from the toe!

P. P. G.

# ROENTGENOGRAPHIC EXAMINATION OF THE URINARY BLADDER *

BY JOHN M. GARRATT, M.D.

Consulting Roentgenologist to the J. N. Adam Memorial Hospital

BUFFALO, N. Y.

THE roentgenographic examination of the urinary bladder is accomplished by one or all of three methods: (1) with the viscus empty; (2) inflated with air or oxygen; (3) distended with a fluid which is opaque to the rays.

The first method is limited to the detection of foreign bodies, including calculi and tumors, which by their composition or bulk absorb sufficient rays to prevent chemical action upon the silver salts in the emulsion of the photographic plate; the second, to more clearly define the shadow of the object within the bladder and, in favorable subjects, to outline the organ; the third, to map out the size, shape, conformity and irregularities in the vesicle wall.

In 1904 Wittek introduced distention with air, and a little later Albers-Schoenberg inflated the bladder with oxygen before taking the roentgenogram. Both procedures improve the picture, but in view of the fact that several sudden deaths have been reported following the procedures they are best not attempted.

In all cases, to complete the technic, the bowels should be emptied of all fecal contents which are likely to cast suspicious shadows; and in corpulent subjects especially, the bladder should be emptied of urine. Occasionally, a urine distended bladder is mapped out on the plate.

The position, form and relations of the bladder in health vary according to age, sex and degree of distention of the organ; and in disease, to the extent of the lesion affecting its wall. When a healthy bladder in the adult is distended, it usually has an ovoid form; in disease it may be orbicular (Fig. 1), or pyramidal (Fig. 2), or irregular in outline.

The bladder, being a hollow organ, lends itself to distention with fluids which are opaque to the rays. From a roentgenogram following the procedure, the size, position, conformation and irregularities, as projection of tumors, enlargement of the prostate, diverticula or pouching and some forms of anomalies all can be diagnosticated, and the approximate size and position shown in a permanent record.

My technic for the roentgenographic examination of the bladder was published in the *Journal of the American Medical Assn.*, issue of January 28th, 1911. Briefly, it is as follows: Pass a soft sterile catheter, and irrigate with a boric acid solution. When the washings come away clear, measure its capacity. With the bladder empty, distend with the capacity quantity of the opaque mixture.

With the patient in the ventral recumbent position and the tube centered over the sacrococcygeal articulation and always preserving a standard distance, a roentgenogram thus taken will give a reliable comparison of the viscus or deformity. I have used this technic in a considerable number of cases and except for, in an occasional subject, some smarting, which soon passed off, there has been no untoward effect.

Argyrol, a 5 per cent., or collargolum a 2 per cent. solution, are sometimes used, but the shadow produced is not nearly as dense as with bismuth mixture. Silver iodid, a 2 per cent. solution, produces a denser shadow than either of the above silver salts.

* Read before the Buffalo Academy of Medicine, January, 1915.

*Diverticula.*—In Dec., 1910, I injected with the bismuth mixture and roentgenographed the bladder of a patient presenting the history and symptoms of chronic cystitis. Two diverticula were shown—one on each lateral aspect of the bladder. The patient, a male aged 70 years, complained of frequent and painful micturition; the daily call to evacuate the bladder was every hour and at night 8-10 times. Frequently he had spells during which micturition was every ten or fifteen minutes. The urine stream was small, with little force, and at times required moderate straining to start it and there was an occasional shutting off of the stream before

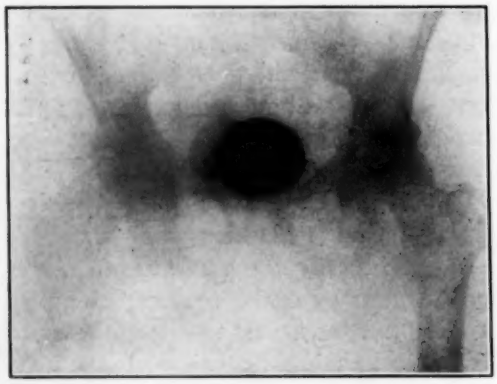

FIG. 1.—ORB-SHAPED BLADDER, SHOWING POSTERIOR DIVERTICULUM.

the act was finished. The pain was severe, smarting and burning mostly in the deep urethra during the voiding act. In 1893 he had had an operation for piles by the ligature method. Immediately following he noticed that he could not void his urine as freely as formerly and micturition was more frequent. The symptoms were not severe until about a year before coming under observation, and for the last three months he had to resort to the catheter, occasionally following the passing of which there was moderate hematuria.

On account of the age and weakened condition of the patient an operation was out of the question. Treatment, therefore, was directed to keep the bladder clean and to avoid distention and to improve his general condition. He was given daily treatments with the d'Arsonval electric currents, and the roentgen rays were applied every other day over the bladder and through the perineum alternately. Early in the treatment he had one attack of acute cystitis, following which the improvement in his symptoms and general condition was progressive. In six weeks day micturition was 5-6 times and he could hold his urine all night. A second roentgenogram taken at this time showed the larger of the two diverticula reduced one-half in size. The capacity of the bladder had increased from eight to ten ounces.

Acting upon the suggestion of the late Dr. Roswell Park this case was reported in full, and it was published in *Surgery, Gynecology and Obstetrics,* September, 1911.

The second patient, who came under my care in June, 1911, was a male aged 21, with tubercular cystitis, secondary to tuberculosis of the left testicle which was removed a year before. Symptoms: Early in 1909 he noticed blood in the urine. His physician inserted a catheter, irrigated the bladder and used a searcher; following this procedure the quantity of blood voided was increased and the call to empty the bladder became frequent—every two hours during the day and every hour at night. Micturition was painful, of a burning character in the deep urethra.

Treatment, as in the previous case, was directed to keep the bladder clean, and he was given *x*-ray treatments. Improvement was slow. On July 25th the bladder was distended with five ounces of the bismuth suspended mixture and a roentgenogram was taken. (Fig. 1.) The bladder was shown to be perfectly globular in form, with a diverticulum about 1/3 of its size attached to the posterior wall. No change was made in the treatment, but his improvement was much more rapid and four weeks later he could take long walks without discomfort.

Gouley, who examined many cases of diverticula discovered mostly postmortem and at abdominal operations, found that the

majority of diverticula are seated laterally. These vesicosacculations occur singly or in multiple. One case on record describes the bladder as having the appearance of a bunch of grapes. In size a diverticulum may be many times that of the bladder. One with a capacity of 4,000 c.c. has been reported.

*Foreign Bodies.*—Various objects have been found and removed by operation. Hairpins seem to be the favorite in women. Pieces of rubber and glass catheters are comparatively common.

Howard Kelly found in the bladder of one of his patients an onion stalk about six inches in length.

Harrison reports having removed a pipestem which the patient stoutly declared he had swallowed some time before; the probability is that it ulcerated through the intestinal and vesicle walls.

Foreign bodies, if left in the bladder for any length of time, form the nucleus of a calculus.

*Tumors of the Bladder.*—Few of these cases are sent to the roentgenologist for the reason that they are more readily detected with the cystoscope. The *x*-rays are of value, however, when the use of the cystoscope is inadvisable or impossible, as in the case of a tumor nearly filling the bladder and in certain diseases of the prostate. I quote Dr. Howard Kelly, illustrating two cases: In the first a papilloma almost completely filled the bladder; the viscus was partly distended with a bismuth emulsion and a roentgenogram taken showed the amount of space not occupied by the tumor, and the exact location of its attachment. The second, also a papilloma; all that could be seen with the cystoscope was a large freshly bleeding mass. The bladder was distended with a silver salt emulsion and the *x*-ray picture showed a very large tumor attached to the bladder wall by a narrow pedicle. Both of these cases appeared at first sight inoperable.

*Vesicle Calculi.*—Of the three methods of diagnosticating stone in the bladder (1) the Thompson searcher, (2) the cystoscope, and (3) the roentgen rays, I believe the last to be the most reliable, and should be used before any other method. It obviates the necessity of passing instruments and the size and position of the stone or stones can be estimated.

Barclay of Manchester, England, detected a stone in the bladder by the roentgenographic method, which had remained undetected after two soundings by a celebrated London surgeon, in spite of the fact that it measured 2¼ x 1½ inches. Another case, quoting the same author, where the roentgenogram showed a stone of ¾ of an inch in diameter, the bladder was searched with a negative result. Suprapubic exploration

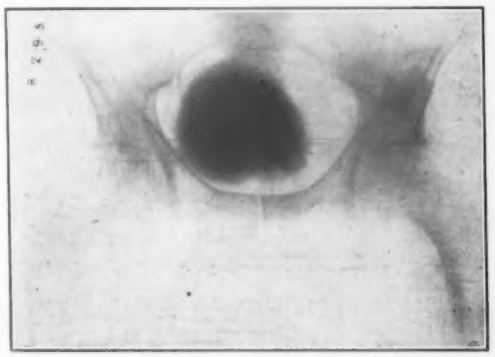

FIG. 2.—A PYRAMID-SHAPED BLADDER WITH A PAPILLOMA ATTACHED TO THE LEFT BASE.

was done and four small faceted calculi were found, after careful search, embedded in the prostate.

Encysted calculi are seldom detected with the searcher, and most frequently cannot be seen through the cystoscope.

In sixteen years experience with the roentgen-rays I have diagnosticated calculi in 86 cases: five were encysted and were not detected with the searcher. The greatest number of calculi shown on a roentgenogram was eleven. In one case a negative roentgen diagnosis was first made; a stone was detected with a searcher. On a second and more careful examination of the plate, a very faint shadow of the stone, about one inch in diameter, was seen. Its composition was pure uric acid.

In male adults uric acid-urate variety of calculi predominate. In forty of the 86 cases

FIG. 3.—SHOWING FOUR PYRAMID-SHAPED CALCULI IN THE BLADDER.

a chemical examination was made to determine their composition, with the following result:

12 or 30% were pure uric acid.
10 " 25% principally uric acid with urates and a trace of calcium oxalate.
6 " 15% phosphatic, with trace of calcium oxalate.
4 " 10% were phospatic.
3 " 7½% were calcium carbonate and phosphates.
2 " 5% were calcium oxalate.
2 " 5% were calcium oxalate and carbonate.
1 " 2½% were calcium carbonate.

Vesicle stones are met at all periods of life; they are most common in young children, and next in old men. All of my cases were in adult males.

It must not be forgotten that tuberculosis of the bladder, at times, gives symptoms simulating vesicle calculi. It is illustrated in a case which came under my care: Male aged 30. Mother died of phthisis. His trouble was of five years standing and had been diagnosticated by his home physician as "stone in the bladder." Symptoms: Constant pain in the urethra at the meatus. When standing or moving about it was sharp and cutting; it gradually became less severe after moving about for some time. There was relief when lying down. There was a nearly constant sensation of a foreign body in the bladder. After violent exercises there was moderate hematuria. The urinary stream was not suddenly shut off. Micturition during the night, seven or eight times. The urine was scalding on voiding—so much so that he purposely did not empty his bladder. Tubercle bacilli were demonstrated in the urinary sediment obtained by catheterization. A roentgenogram for stone gave negative result.

Under medical and *x*-ray treatments all of the symptoms, except those of a contracted bladder, disappeared.

The six largest calculi reported weighed 51, 46, 44, 40, 39 and 34 ounces respectively. The largest in my collection weighed 11½ ounces. Single stones of considerable size are ovoid or spherical; multiple stones, pyramidal (Fig. 3) or pyriform, and in addition, multiple encysted calculi may be faceted.

The density of the stone shadow on the plate often will determine its composition—a calcium oxalate stone, for instance, gives a dense shadow; a phosphatic, a medium dense, and the uric acid-urate variety, a light shadow. In some of my roentgenograms several densities in the form of concentric laminations were seen in the same stone.

The ordinary roentgenogram registers various densities—in other words, it is a flat picture, and there is an overlapping of the shadows. In a stereoroentgenogram both sides of the object are seen in relief like the real object instead of a flat picture. Stereoroentgenograms of bladder objects are advised.

# THE AMERICAN JOURNAL OF ROENTGENOLOGY

PUBLISHED BY PAUL B. HOEBER, NEW YORK CITY

*Issued Monthly. Subscription, $5.00 per year. Advertising rates submitted on application. Editorial office, 32 Adams Avenue West, Detroit, Mich. Office of publication, 67–69 East 59th Street, New York*



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## EDITORIALS

### VISITING ETIQUETTE

While it must be acknowledged that the roentgenologists of America are a cordial class of men, who are very willing to impart the knowledge of their particular art to their fellows, it occasionally happens that their good nature is imposed upon by visitors. While it is very pleasant to visit laboratories and to see the work of others, we feel that certain admonitions are necessary in order to preserve the feeling of cordiality which still exists.

In visiting a man's private office, it usually happens that a certain percentage of his cases are such that they can not be shown to visiting physicians without causing some feeling on the part of the patient. We must remember that there is always a confidence which patients feel in going to a physician's office that their ailments will be treated as confidential, and not be laid bare to visitors or to those who are not directly interested in the study of their case. Visiting roentgenologists should not expect to be shown cases unless they are directly invited to see the case. We have known many cases where visitors have walked directly from the waiting room into the consulting room without being invited, to the great embarrassment of the attending physician, and usually of his patients.

Another point which we feel constrained to make in the relations between the host and visitor is that the visitor should not vouchsafe inquiries or remarks about the patient's condition in the patient's presence, unless invited. Personally we have had very embarrassing situations arise from the chance remarks of the visitors who have been invited to see cases with us. The time for such questions and voluntary opinions is after the patient has retired to another room. On one occasion, while engaged in making some stereoscopic plates of a child who was mentally deficient, the visitor who happened to be present vouchsafed the remark that the child looked like a Mongolian idiot, a remark which we feel very certain did not tend to please the feelings of the mother who was having the child examined. Opinions as to the course of treatment with regard to the prognosis of the particular case under examination should, we think, not be volunteered unless directly invited.

While we feel that these remarks may not be applicable to the great number of roentgenologists, still we feel that there have been enough unintentional violations of the courtesies which should exist to call attention to these points.

## The Roentgentherapeutist

The good results that have been obtained by roentgentherapy in deep-seated malignant disease, and in gynecological affections, have created a demand over the whole country for roentgentherapy, and consequently roentgentherapeutists. Patients and general practitioners have not yet learned to differentiate between the instrument and the operator, and therefore many unskilled and uninformed physicians are attempting to do roentgentherapy, which is in danger of leading to the same sort of distrust that delayed the development of this phase of our specialty about ten years ago. The fact that there are much fewer high-class roentgentherapeutists than there are high-class roentgen diagnosticians shows that the subject is a difficult one, and must be approached with that thought in mind. At least it must not be undertaken by any but physicians, and not treated as a minor or insignificant field which can be managed by nurses, orderlies, etc.

The advent of the Coolidge tube and the high power transformers has placed in our hands a tremendous power many times greater in its effect than the largest quantity of radium in one collection, but this increased power can do tremendous harm, in spite of the good, when placed in the hands of incompetent operators. No one would think of placing surgical instruments, which probably have less power for harm, in the hands of untrained assistants such as are sometimes called upon to do roentgentherapy, and expect them to do the character of work that is to-day demanded of a high-class surgeon.

The roentgentherapeutist should understand the principles involved in the physics of roentgenology. He should be well-informed in general medicine; should understand the pathology of the disease that he is called upon to treat, and then should be familiar with the technical knowledge that is approved by the best authorities in the treatment of each particular disease. He should be familiar with the effects of the roentgen rays on the living cell, such as have been so carefully studied by our scientific investigators, and especially as have been so ably reviewed by Colwell and Russ in their book on "Radium, X-rays and the Living Cell." We can see at a glance that the mastery of these requirements is no child's play, but means hard and continuous work, and should be associated with a deep sense of responsibility.

G. E. P.

## Roentgen Societies in America

In many parts of our country small groups of men interested in the roentgen ray are forming societies for mutual benefit and exchange of ideas. This is eminently commendable.

The Philadelphia Roentgen Society was probably the first independent sectional society and it would be splendid if every new roentgen society would take this organization as a model in membership, energy and ideals. Then followed the Chicago Roentgen Society, the New York Societies, the Texas Roentgen Society, the Pacific Coast Society, the Omaha Roentgen Society, and lastly, the Western Roentgen Society.

Certain of these organizations maintain a membership paralleling the requirements of the American Roentgen Ray Society, notably the Philadelphia, New York, Chicago and Pacific Coast Roentgen Societies. It is impossible to expect that all of the groups shall declare such difficult qualifications.

There will always be sectional surgical meetings, but the American Surgical Society will still be the goal of every ambitious and worthy surgeon of character.

It would be wonderful if some of these

roentgen societies would undertake some contribution to roentgenology such as the New York Roentgen Society has produced in the quarterly of *Stereoscopic Roentgenology*. There were symptoms of a project to standardize exposure positions at the recent meeting of the Western Roentgen Society at St. Louis.

The Texas Society has busied itself in an educational campaign in its immense territory. The character and scope of their papers at their recent semi-annual meeting is worthy of a much larger journalistic audience. Those who have not visited this immense state can hardly realize the extent and calibre of Texas roentgen activities.

The ambition of every scientific society should be to elevate the character, education and integrity of its membership. It would therefore seem advisable to include within the organization group roentgenologists who are attached to parent societies and who are cognizant of the ideals and counsels of a scientific specialty. There are always plenty of joiners, but organizations everywhere need advisors and leaders.

The astounding activities in roentgen diagnosis and radiotherapy in the medical and dental professions rather force the organizations of these groups for mutual benefit and protection. Fee schedules have been proposed and adopted in some societies. It would be much better to devote time to social intercourse if scientific papers are not exciting enough.

The time has hardly arrived for the promotion of formal sectional societies under the parent organization. The Eastern and Mid-West winter meetings have always been delightfully informal and the open, frank discussion of timely topics usually adds a zest to these gatherings which is lacking at the annual meeting. E. H. S.

## Preparedness in Roentgenography

The wave of preparedness which is sweeping over the country at the present time has resulted in the establishment of base hospital units, which it is the purpose to completely equip so that they can be sent to the front on very short notice and assist the national government by having base hospitals at a suitable distance from the field of operation. These hospital units are being organized at the present time, and their whole equipment is under consideration.

Naturally one of the points which would concern the readers of this Journal is the roentgen equipment. There is not on the market at the present time any piece of apparatus which would be at all suitable for adoption by these various organizations. The points on which the selection should be made are, first, efficiency of apparatus; second, transportability; and third, adaptability. By the last phrase we mean a type of apparatus which could be used either on direct or alternating current. As these outfits are to be operated from a local commercial lighting source, and as the latter vary in different localities, it would be necessary to have a machine designed which could be operated either from direct or alternating current. While we perhaps are asking what may seem rather difficult to obtain, still the situation should be met and suitable current generators adaptable to any source of supply should be incorporated.

While it might not be a good business proposition for the management of these base hospital units to purchase roentgenographs at the present time, just as they are buying cots, blankets and other standard articles for hospital equipment, still we think the design of the machine should be worked out and competitive bids asked so that contracts could be made for the obtaining of these machines on the shortest possible notice. In this way, the roentgenologic departments could be considered as fairly well equipped without the expenditure of prohibitive sums of money.

# DEPARTMENT OF *LABORATORY NOTES*

EDITOR, *David R. Bowen*, M. D., *Philadelphia, Pa.*

## DEVICE FOR OBTAINING BETTER DETAIL IN DENTAL FILMS

BY ALBERT M. COLE, M.D.

INDIANAPOLIS, IND.

It is a well-known fact that the smaller the area exposed the less the number of secondary rays arising from the tissues penetrated and consequently the better the detail obtained on the plates or films. Accordingly I had made for the Kelley smallest sized cone an attachment pictured in Fig. 1, which clamps to the cone by three set screws, Fig. 2. This attachment has a diameter of 2½ inches and is large enough to cover the size film generally used for dental work. In other words, it is a diaphragm made after the principle of the Hickey cone and I find it improves the detail on the film very markedly. Care must be used in placing the cone so as to cover the film in the mouth as there is little space to center upon; but with ordinary caution one will rarely fail to expose the whole surface of the film. By observing the proper angle and by an exact centering of this small diaphragm and the use of low vacuum tubes there can be obtained a wealth of detail in dental films which add greatly to their value in diagnosis.

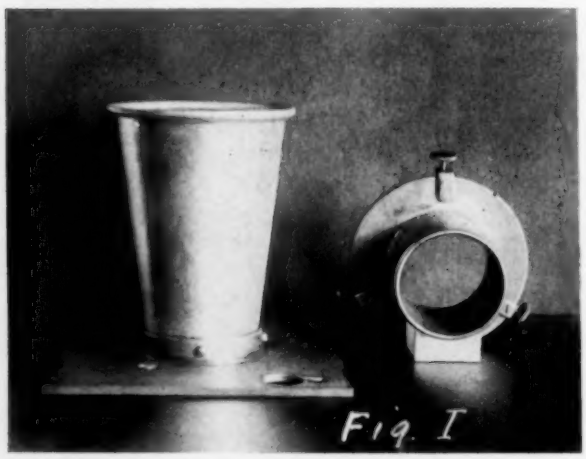



FIG. 1.—CONE ATTACHMENT FOR OBTAINING BETTER DETAIL IN DENTAL FILMS.

FIG. 2.—THE DIAPHRAGM IN PLACE.

# A DEVICE FOR ACCURATELY CENTERING AN X-RAY TUBE IN THE TUBE STAND

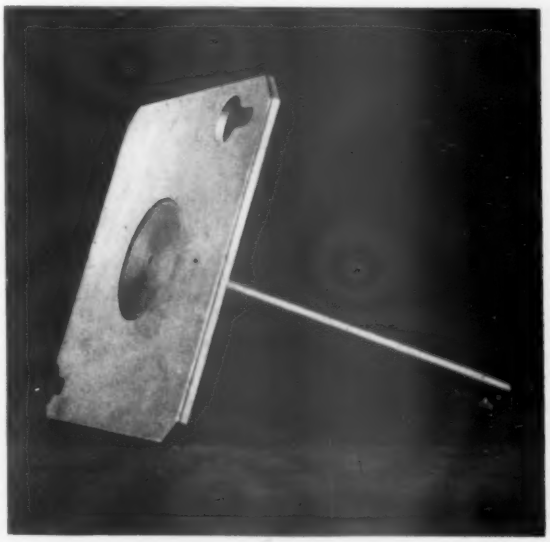
WHEN large or even medium sized diaphragms are used the need for accurate centering of the tube is not great. If the resulting circle of exposure is a bit cut off on one side it is not likely that any important detail has been lost and the defect is one of appearance only. When we come to use the smaller diaphragms or cones the practical need for accuracy in centering becomes of first importance, for a very considerable percentage of the field which it was intended to expose may thus be omitted.

Various devices have from time to time been offered for this purpose, most of which have served very well to indicate where the "central ray" will strike the patient but afford little or no help in bringing the tube into this indicated line. None that we have seen could be used with the tube actually in the holder.

The device here illustrated may be made to fit any of the commonly used stands by either buying from the makers an extra cone base or by using one of your own as a pattern for a brass or aluminum casting by a local foundry. A brass plate is next turned to fit this base and is centered on the lathe. This plate has on the top side an opening of $\frac{1}{16}$ inch and on the under side an opening large enough to hold the end of a $\frac{1}{4}$ inch tube, which tube is adjusted in the lathe accurately perpendicular to the cone base.

To use, the device is inserted into the tube stand as is the usual cone, and the tube turned 90 degrees to a horizontal position with the focal spot upward and in a good light. If then the tube is moved about until the focal spot can be seen through the brass tube it will be accurately centered.

Once centered, a mark should be pasted on the tube to match another mark on the holder so that when that tube has been removed it may be returned to its proper position without the trouble of again centering it.



DEVICE FOR ACCURATELY CENTERING AN X-RAY TUBE.

The thumb screw shown at the lower end of the device may be used, if so desired, to hold an extension pointer to indicate the path of the central ray and, for this purpose, may be used at any time with the same facility that the various sized cones are changed and without disturbing the position of the *x*-ray tube.

# DEPARTMENT OF TRANSLATIONS & ABSTRACTS

EDITOR, *James T. Case*, M. D., *Battle Creek, Mich.*

FRIEDLANDER, ALFRED. Sarcoma of the Kidney Treated by X-ray. (Paper presented at the twenty-eighth annual meeting of the American Pediatric Society, Washington, D. C., May 8–10, 1916. *Archives of Pediatrics*, May, 1916, p. 344.)

Friedlander said it was generally accepted as axiomatic that the only hope in cases of sarcoma of the kidney in childhood lay in early nephrectomy, but even with this procedure the mortality was very high on account of the likelihood of metastases, even in those cases in which the operation was well borne. The patient was four years of age and was admitted to the Cincinnati General Hospital on October 20, 1915. The history was one of increasing languor and lassitude, with loss of appetite and anemia. Except for the condition of the abdomen, the physical findings were not of moment. The entire left abdomen was filled by a tumor extending from the costal margin in the nipple line to 3 cm. above the umbilicus. It was hard, distinctly nodular, apparently not tender to touch, and could be moved forward by pressure from behind. Urinalysis on admission showed distinct microscopic hematuria. The blood showed a secondary anemia. Fluoroscopic examination with the colon partly filled with gas showed a sharply-defined dark shadow in the region normally occupied by the kidney. *X*-ray plates of the lungs for the characteristic metastatic sarcomatous shadows were negative. The *x*-ray treatments were given because of the apparent hopelessness of the case. After the seventh treatment it was noticed that the tumor had decreased very markedly in size. Later the child had an attack of influenza, then one of measles, which was followed by death. The autopsy revealed a sarcoma of the left kidney, with small metastases in both lungs and in the liver.

The pathologist's report was presented and it was noted that the stained sections showed the most widespread and generally diffuse necrotic changes with no evidence of inflammatory reaction; the stroma showed degenerative changes, associated with irregular areas of edema. The parenchyma was almost completely necrotic and showed almost no evidence of structure. In the areas in which some stroma persisted the appearances were those of alveolar sarcoma, and in these areas short spindle cells and round cells were present, chiefly in the latter. The fact that the whole necrotic process was so widespread in so large a tumor mass; that there was no evidence of vascular thrombosis in the main vessels, and no evidence of infarction; and the fact that the degenerative process appeared to be gradually progressive, indicated that the *x*-ray treatments were at least partially the cause of retrogression. This was a particularly unfavorable case and it seemed justifiable to say that if nephrectomy was contraindicated in a case of sarcoma of the kidney the *x*-ray should be given a thorough trial.

BOGGS, RUSSELL H. The Treatment of Tuberculous Adenitis by Roentgen Rays. (*New York Medical Journal*, May 27, 1916.)

Cases of tuberculous adenitis are referred for roentgen treatment to-day, largely because the end results after radiotherapy have proven to be better than those of surgery.

Tuberculous glands are frequently of wider distribution than the clinical signs indicate, and local lesions are often so situated that they are difficult to reach by any method other than radiotherapy. It is alleged that at least ninety

The Abstract Editor is indebted to the *Zentralblatt für Roentgenstrahlen, Radium und verwandte Gebiete* for material aid in the production of abstracts of many of the foreign articles.

per cent. of these cases can be permanently cured by radiation.

Reliable observers notice great differences in the percentage of successes and failures by the roentgen method. The reasons for these clinical differences can be pointed out when we study the different methods of treatment. It is generally conceded that real efficiency in these cases is obtained by the use of the hard filtered rays, applied in the proper quantity and quality, which can only be determined by one who has had experience and has adopted a suitable technique. Many are giving the same massive doses that they give in the treatment of malignant growths and expect successful results in one or two treatments. The treatment of malignant disease is an entirely different proposition from that of tuberculous adenitis. The results are produced, in the former disease, almost entirely by the local action of the radiation. Since the rays are not bactericidal, it has been suggested that, in the treatment of tuberculous adenitis, the results are produced by destroying the tissues of low resistance, thus rendering the soil barren.

Striking results are frequently obtained in large glandular masses even when suppurating and about to break down. Many of these cases are as permanently benefited as the cases in which the glands are only of small size. We are unable to account for this, unless it is due to the fact that there is in the large tumor more glandular tissue, which is easily affected by radiation. Hence, there must be a constitutional effect which is more pronounced when a large amount of tuberculous tissue is rayed.

These facts suggest that, in the destruction of tuberculous tissue, autogenous vaccines are set free, which are superior to tuberculin. Crane pointed this out in an article, "Specific Immunity and X-ray Therapeutics," in the *American Journal of Medical Science*, March, 1908. This probably accounts for a tuberculous process disappearing in one part of the body when a tuberculous mass is rayed in another part. Several times I have had tubercle bacilli entirely disappear from the sputum of a patient being rayed for tuberculous cervical adenitis.

When a chain of lymphatic glands is properly rayed, the glands undergo fibrous degeneration and the lymphatic vessels become fibrous cords, without seriously influencing the surrounding tissue. If the glands are diseased, the reaction of the epithelial cells is much quicker and more marked. Since diseased cells are less resistant to the rays than the normal, it can be readily seen that the same amount of radiation which destroys the diseased cells may stimulate the surrounding healthy tissue. The result is that the glandular mass shrivels up, certain glands cease to be palpable, others become small fibrous nodules, in most instances free from tuberculous foci.

In order to show the variety of opinions in regard to the treatment of tuberculous adenitis, the author quotes a paragraph from Johnson's "Operative Surgery", 1915, in which the statement is made that the treatment depends largely on the specialty of the physician first consulted. There are the hygienic, the *x*-ray, light therapy, vaccine, laryngological (that is, treatment directed to the portal of infection) and the various surgical procedures.

Von Mutschenracker offers conservative treatment and states that he has operated on only nine per cent. of 1,344 cases. Blaisch divides tuberculous adenitis into hypoplastic, purulent or cheesy, and ulcerated or fistulous. The hypoplastic are rayed without surgery; in the suppurative cases he advises aspiration or incision, followed by radiation, although he admits that the rays will cause an absorption of the pus. There seems to be a tendency to recommend such surgery only as is unavoidable. The papers of Stone, Dowd and Miller are strikingly in contrast to this tendency.

Matthews and De Costa are quoted as advocating complete extirpation of well-localized diseased glands and a combination of methods in non-localized cases.

Different authorities call attention to the fact that when medical treatment alone is adopted from twenty to twenty-five per cent. of the patients ultimately acquire pulmonary tuberculosis. Medical measures can be continued in conjunction with the roentgen ray.

Conclusion: Radiotherapy stands in a different place than it did a few years ago. The Coolidge tube has contributed to this advancement. The same massive radiation is not indicated in the treatment of tuberculous adenitis as in that of malignant disease. The patient should have good hygienic surroundings, and not attempt strenuous work, for a time at least. When there is also pulmonary involvement, the combined hygienic and roentgen ray method is the only one to be considered.

Early use of the roentgen ray prevents suppuration and sinus formation and reduces the percentage of cases to a minimum which need the services of the surgeon. Prophylactic treatment is important, and has not received proper attention. All channels of any form of infection should be eliminated.

BASCH, SEYMOUR. Some Remarks on the Underlying Principles and the Clinical Value of Radiology of the Digestive Tract. (*Arch. Diagnosis*, Vol. IX, No. 1, Jan., 1916, p. 27.)

While telling nothing new to the roentgenologist about the underlying principles of roentgenology, Basch expresses his digest of the diagnostic value of roentgenology as applied to the gastro-intestinal tract. He is careful not to allow the roentgen method to encroach too far upon the clinical preserves, as he will not have roentgenography applied except when a diagnosis through the approved clinical and laboratory methods is impossible or uncertain, or where the choice between medical and surgical treatment remains in doubt. To make doubly sure, he places no reliance on either roentgenoscopy or roentgenography alone, but will have both methods combined in the study of each case. He discards gas or air inflation as abandoned. The use of atropin and papaverin in the differentiation between functional and organic contraction not being dependable, he prefers massage, change of posture or manipulation of the parts, or, with these measures failing, a repeated roentgen examination on a different day. In the author's experience, even the latter failed to furnish the proper interpretation in a case of epigastric hernia. But he found the *x*-ray our most valuable means of determining the size, form, position, fixity, tone, peristaltic activity and motility of the hollow digestive organs, while he admits its usefulness in a number of other conditions with which the roentgenologist is familiar.

LOUNSBURY, BENJAMIN F. A Fracture of the Os Calcis. (*Surg., Gyn. and Obst.*, Vol. XXII, No. 6, June, 1916, p. 638.)

The growing practice of submitting doubtful injuries to the *x*-ray has shown that many conditions about the foot and ankle, at first looked upon as sprains, are in reality fractures, especially of the calcaneum. After describing the anatomical conditions, the author explains the varieties of fractures of this bone and the treatment to be instituted. The results of treatment have been very unsatisfactory in the past either through lack of early diagnosis or inadequate management of the cases. Without roentgenograms, the condition can hardly be recognized and before the advent of the *x*-ray mistaken diagnoses were the rule. To-day, they should be the exception. In the differential diagnosis between fractures of the os calcis and other injuries, the roentgenogram is the court of last appeal, although it would have been better for the patient had it been the first.

The author criticizes some of the mistakes committed in the treatment and describes the practice followed by him which gives excellent results. The article is accompanied by 15 roentgenograms and a bibliography of 38 publications on the subject.

DAVIS, GEORGE G. Roentgen Ray Diagnosis of Gas and Pus Infections Complicating Bullet and Shell Injuries. (*Surg., Gynec. and Obst.*, Vol. XXII, No. 6, June, 1916, p. 635.)

Dr. Davis, of Chicago, who officiates as a surgeon with the British war contingent in France, describes some new roentgen findings in bullet and shell injuries. A halo-like shadow gives evidence of an infection by gas or pus-forming organisms. The halo is circumscribed or extending in various directions according to the track of the missile and the accompanying infection, as exemplified by six roentgenograms. The clinical findings have so constantly confirmed the roentgen diagnosis that he considers the same an indication for urgent surgical interference.

SCHOENFELD, A. Pyonephrotic Movable Kidney. (*Fortschritte auf dem Gebiete der Roentgenstrahlen*, Vol. XXIII, No. 6, March 2, 1916, p. 498.)

In the present state of roentgen technic, a picture of the renal region is not considered satisfactory unless the well-known contour of the kidney is distinctly visible on the plate. With the typical position of the roentgen tube,

the lower pole of the kidney appears at the level of the transverse process of the third lumbar vertebra, slight deviations having no pathological significance. The physiological width of the kidney varies between 5 and 6 cm., according to the size of the individual. If the kidney appears in a different location, the organ is displaced. This can be clinically established in a movable kidney, but roentgen control is advisable when a bimanually palpable tumor is to be identified as the kidney.

If the renal shadow is too broad or too narrow, the conclusion is that the kidney is enlarged or contracted; if there are shadow defects or other irregularities in shape, the presence of renal tumors may be assumed. If the otherwise regular outline is interrupted by notches, they are caused by shrinking processes and cicatricial retractions.

A double contour of the lower renal pole is described by Haenisch as typical for hydronephrosis, the deeply descended hydronephrotic sac causing the second shadow.

Further information on the shape of the renal pelvis, calices and pyramids is unobtainable by simple roentgenography. Schmidt and Kolischer (1901) inserted a catheter with a mandrin which they unrolled in the renal pelvis, the exposure showing the approximate size of the renal pelvis. The dangers of this method to patient and operator alike are totally disproportionate to the meager results.

Klose, in 1904, injected a bismuth emulsion into the renal pelvis. This constituted an advance in the determination of the shape, but the introduction of the heavy metal salt was objectionable on account of its forming a base for concrements in the urinary tract.

The year 1906 was a turning point in the examination of the hollow spaces of the urinary tract. Voelker and Lichtenberg having had the courage of injecting 5–10 per cent. collargol solutions, a method had been originated which, with careful application, was a harmless and valuable addition to urological diagnosis, although it is by no means applied frequently enough.

The capacity of the normal renal pelvis is only a few cubic centimeters. On injection of 2–3 c.c. into the renal pelvis through the ureteral catheter, the pyramidal apices are seen to dip sharply into the calices when the conditions are normal. Every alteration of this part of the pyramids and every dilatation of the calices is distinctly visible. In good exposures the thickness of the calices can likewise be observed. When a little more collargol is injected, filling the entire renal pelvis, its shape and size can be distinctly observed.

A careful study of these normal filling pictures is necessary for the understanding of pathological conditions and changes in the renal pelvis and the adjoining organic parts.

A number of etiologically different affections occur with a dilated renal pelvis, which may be due to internal and external causes.

The internal causes are scars or stones in the efferent urinary ducts, kinkings or folds and valvular formations in the ureter. The external causes consist in pressure from without by tumors, inflammatory changes especially of the internal genitals, adhesions or cords which are deuteropathic conditions of abdominal or gynecological affections. These also include impeded urination due to the pregnant uterus. The degrees of dilatation of the renal pelvis may vary widely. In advanced cases, hydronephrotic sacs may develop, equal or superior in size to the kidney. Taken correctly, the pictures of these collargol-filled sacs are very sharp; so are the borders of the calices. If the borders of the pyramidal apices are distinctly recognizable, it is, according to Haenisch, a sign in favor of hydronephrosis and against tuberculosis.

The possibility of diagnosing renal tuberculosis, which in ordinary roentgenography is assured by the appearance of light, indistinctly demarkated spots, representing tuberculous foci in the parenchyma, is increased by the use of pyelography. The changes in the renal parenchyma can only be seen after the difference in density between the changed focus and the surrounding tissue has become so great that in spite of the thickness of this part differentiating shadows are obtained on the plate.

As regards the border line between parenchyma and hollow spaces, the differences in density may be artificially increased by the collargol filling. An early roentgen diagnosis of renal tuberculosis, however, is impossible. Whether it will be possible in the absence of tubercles in the urine and in negative animal experiments to find guiding points admitting of a roentgenological differentiation between tuberculosis and other pyelitic affections, can only be decided after a careful pyelographic study of pyelitic changes of the renal pelvis.

*Case T. M.*, was a married woman sixty-one years of age. Has always been healthy up to the end of 1913. Then appeared increased urination with burning pains. Sitzbaths and tea infusions effected an improvement in three months. In the following April the urinary complaints increased, but there was no burning. Appetite bad. Emaciation. Neither cough nor night sweats.

Present condition. Greatly emaciated. Vesicular respiration over the lungs, fine crepitating râles over the apices, disappearing after a few respirations.

Movability of pulmonary borders slightly reduced. Percussion sound with a tympanitic admixture. Pulmonary impulse in the parasternal line, strongly rising. Cardiac dullness to the right not enlarged. First apex sound very loud; very short rough systolic noise which is more distinct in the upper region. There is a very soft systolic sound over the aortic ostium. Powerful pulsation noted in the jugulum. Left thyroid lobe enlarged. Radial pulse small, rapidly decreasing, the vessel itself narrow and rigid. Patellar reflex absent. Pupillary reaction slow. Abdomen above the umbilicus protruding; below the umbilicus bilaterally egg-shaped. Abdominal walls relaxed, easily but painfully depressible.

The right lower renal pole is palpable by bimanual palpation and movable in all directions, preferably upward and downward, while its position is unchanged at deep inspiration. It can be felt all around and its upper part can be distinctly grasped. Surface smooth and elastic. The upper pole is at the level of the umbilical horizontal, the lower pole about a finger's width below the spina anterior superior. The lower pole can be easily pushed up to the level of the navel. Counter-pressure from the loin causes pain of the tumor.

Cystoscopy, June 6, 1914.—Left transition fold very hyperemic, concave, smooth. Trigonum very hyperemic and swollen. No ulcers. Bladder contents 150 c.c.; tension. Mucous membrane without vascular tracing, edematous, hyperemic, sanguineously mottled in parts, minute sticky pus shreds, very light degree of trabecular formation. Both ostia represent a widely open slit, downward concave, with overhanging upper lip. Both ostia quite rigid, very hyperemic, slight loosening in the neighborhood. The left ostium secretes purulent urine. Blue secretion on the left after more than 25 minutes; dark blue on the right after 17 minutes.

Roentgen Findings, June 25, 1914.—The right lower renal pole is located between the second and third lumbar transverse processes. Sharp regular contours of the renal shadow. The left lower renal pole not visible. A lead catheter is inserted through the left ureteral ostium. The roentgen exposure shows the catheter running in typical fashion medially from the synchondrosis sacro-iliaca, almost sagittally upward. It terminates immediately over the fourth lumbar transverse process. Descent of the kidney.

Another exposure is made after an injection of 20 c.c. collargol. The upper pole of the left kidney is located between the first and second lumbar transverse processes, the lower pole about 1 cm. below the iliac crest. The kidney is sharply marked beside the psoas, size 10 x 6 cm., shape normal. The point of the catheter is not in the renal pelvis. Apparently, there is a slight kinking of the ureter. The collargol shadow runs from the catheter point outward, forming an angle and terminating at the level of the third lumbar transverse process 1–2 cm. laterally into the renal pelvis. The filling picture of the latter is abnormal. The collargol filling shows considerable dilatation, especially of the calices; the papillæ are destroyed. The parenchymatous layer in the picture has an average width of 1 cm.

This, therefore, is a case of a greatly prolapsed kidney with destruction at the pyramids. The renal pelvis itself shows no dilatation. Its filling condition and the uppermost part of the ureter point to a considerably changed thickened wall which is usually associated with pyonephrosis.

# BOOK REVIEWS

EDITOR, *Edward H. Skinner*, M. D., *Kansas City, Mo.*

THE PRACTICAL MEDICINE SERIES. Comprising ten volumes on the year's progress in Medicine and Surgery. Charles L. Mix, M.D., General Editor. Vol. I: General Medicine, edited by Frank Billings, M.S., M.D., Chicago. Vol. II: General Surgery, edited by John B. Murphy, M.D., Mercy Hospital, Chicago. (June, 1916). Octavo of 176 pages, 42 illustrations. Vol. III: Eye, Ear, Nose and Throat, edited by Casey A. Wood, M.D., Albert S. Andrews, M.D., and George E. Shambaugh, M.D. Series 1916. The Year Book Publishers, 327 South LaSalle Street, Chicago. Price $10.00 per year for ten volumes or $1.50 per volume.

The publishers announce that this series of monthly volumes is primarily for the general practitioner. It would be better to advise specialists to invest in these books so that they will not become warped in their own small medical domain.

The roentgenologist serves so many of the specialties in medicine that he must be alert and find some short route to the progress in the various fields. Constant and increasing reading of medical periodicals offers disadvantages as one must necessarily read much which is useless, unproven, biased or premature.

When the wheat has been separated from the chaff by specialists of extensive and intensive experience as in this *Practical Medicine Series*, the general practitioner and specialist will find their reading labors much lessened and greatly improved.

Where, for instance, could one find that pertinent subject of dental and tonsillar infection more conveniently and comprehensively discussed than in Vol. III of this series? The constantly recurring dispute upon the relative values of physical signs and roentgen findings in thoracic cases finds added fuel in Vol. I. But it is not the merit of the roentgen items in these volumes which prompts this expression of their values so much as the broadening influence upon the roentgenologist if he will absorb information upon the progress in medicine outside his own highly specialized branch.

It may seem rank heresy for a surgeon of high position to advocate a surgical means of finding needles without previous roentgen negatives. Probably most roentgenologists would consider this grotesque, but upon page 91 of this Vol. III we find a convincing description of Skillern's method.

STEREOROENTGENOLOGY OF THE ALIMENTARY TRACT, BY JAMES T. CASE, M.D. PARTS II AND III. The Southworth Co., $9.00 per part.

This is preeminently a work whereby the internist and the surgeon may acquire an authoritative view of the roentgenology of the gastro-intestinal tract. The first two sections of this work have already been reviewed in the JOURNAL. These last two sections, making in all 100 stereograms, complete a series that has given America an unquestioned lead in abdominal stereoroentgenology. It is gratifying to American pride that this was accomplished before the war and at a time when roentgenology was at a high tide in European centers.

Beginning the series are two cases of acute obstruction of the small intestines, which present the following diagnostic points: (1) characteristic reticulated gas-distention of the small bowel without bismuth, (2) dilatation associated with narrow lamination of bismuth contents, (3) the passage of bismuth to the point of obstruction, notwithstanding fecal vomiting. Mention is made of the tendency of an obstructed jejunum to localized distentions, the size of a fist, showing fluid levels with patient standing.

Five cases of chronic partial-obstruction of small intestine show that the roentgen images are similar to those of acute obstruction but of less degree when the obstruction is in the jejunum or upper ileum. Four of the plates illustrate the type of obstruction caused by adhesions

about the lower ileum from old appendices, previous operations and Lane's kinks. Case recognizes as normal a delay of the bismuth meal in the terminal coils of the ileum equal to the delay of bismuth in the stomach, but states that a similar delay higher than the terminal ileum is always pathological. He also states that: "Any kind of bowel obstruction will cause exaggerated peristaltic activity with distinctly increased antiperistalsis."

Just as the duodenum must be considered in connection with the stomach, so the terminal ileum must be considered in its relation to the colon. The ileocecal valve has been shown by Case to have an importance second only to the pylorus. These valuable diagnostic studies have been made fruitful by the genius of Kellogg, who, as the result of Case's work, devised an operation for ileocecal incompetence which is remarkable for both simplicity and effectiveness. Six stereos and an unusually full text present the subject. Out of three thousand bismuth cases studied, 500 showed varying grades of ileocecal incompetence. Case gives three causes of ileostasis, viz., adhesions, spasm and valve-incompetence. He says that the terminal ileum is normally empty within ten hours provided there is no gastric residue. According to his experience many ileal-adhesions do not obstruct and are, therefore, not of surgical importance, but when the lower coils of ileum occupy a position higher than the true pelvis there will usually be found some abnormal condition. "The characteristics of obstructing adhesions of the terminal ileum are (1) dilated terminal ileum separated from the cecum by (2) constricted terminal ileum." It is evident that Case's other papers on this subject must be consulted for a full understanding of this important matter.

A normal colon like a normal stomach is a composite picture in the mind of a roentgenologist. Case gives one stereo which he calls normal colon. It is evident that the physical structure of the individual must be a factor in each case.

A rare stereo is given showing normal colonic peristalsis. It is a rare event in roentgenological experience to observe on a screen the "mass movement" of Holzknecht. Yet here we have a stereoscopic set showing a long "segment of bowel which has lost its haustral markings and is formed into an ovoid sausage-shaped mass."

Case states that a persistent failure of peristaltic waves to begin at the tip of the cecum is probably a sign of adhesions about the cecum. Also that "the cause of constipation is to be found in the majority of cases in the colon below the crest of the left ilium; that is, in the pelvic colon and rectum, the marked spasticity of this portion of the bowel being found almost invariably associated with adhesions."

Distortions of the colon due to pregnancy, splenic tumor, calcified mesenteric glands, adherent sigmoid, and carcinoma of the various abdominal viscera illustrate the dangers of attempting to make a diagnosis from plates alone or by the *x*-rays alone. The distinction between adhesions and malignancy may require a careful sifting of all the clinical data in the case. In cancer of the stomach it is remarkable how little obstruction may result even from extensive involvement, but in the intestines and colon it is equally remarkable how quickly obstruction results from a small involvement.

Two cases of Jackson's membranes may be contrasted with cecum mobile et atonicum. These are cases which the experienced roentgenologist by proper screen technic can detect with unerring facility.

Six stereograms illustrate conditions brought about by appendiceal adhesions.

In a case of generalized peritoneal carcinomatosis, Stereo 57, Case states that the "peculiar disposition of bismuth is characteristic of a peritoneal thickening."

In the text, Case refers to fifteen cases of multiple diverticula of the colon, but does not show plates of any. In this connection we may express the hope that Case will continue to publish sections of the stereoscopic atlas so that the medical and surgical world will have a glimpse of the immense number of carefully studied cases which have already passed through the hands of this master of roentgenology.

Gall-stones, spastic constipation, fecal fistula, calcified fibroids and an *x*-ray demonstration of the fallacy of the so-called "high enema" make up the 50 stereoscopic plates of these concluding sections.

The superiority of the stereoscopic method is incontestably shown. The technical beauty of these plates has never been surpassed. European methods grafted upon American stock have produced fruit of the highest order of excellence.

A. W. C.

LOCALIZATION BY X-RAYS AND STEREOSCOPY. By Sir James Mackenzie Davidson, M.B., C.M., Aberd., Consulting Medical Officer, Roentgen Ray Department, Royal London Ophthalmic Hospital, and X-Ray Department, Charing Cross Hospital; Fellow, Physical Society, President, Radiology Section, Seventeenth International Congress of Medicine. With 35 stereoscopic illustrations on special plates and other figures in the text. Paul B. Hoeber, New York, 1916. Price $3.00.

We heartily welcome the opportunity of securing a book by the leading radiologist of the English speaking world. Sir Mackenzie Davidson's interest in the *x*-ray has been of early and persistent vigor. His original experiments are the basis of successful localization of foreign bodies by stereoscopic roentgenography. For clear, lucid descriptions of stereoscopic principles and practice without redundancy or involved phrases this brief book is a gem. Furthermore, the illustrations are so well chosen and executed stereoscopically that the publication in its entirety is especially commendable. There are undoubtedly more comfortable ways of spending a Sunday afternoon in a hot climate, but your reviewer asks no more pleasing task under these conditions than to be offered a monograph such as this English radiologist has provided.

Possibly there are other books which provide similar information but they have failed to present the subject with such clarity and brevity and readability. The exigencies of the European conflict have rather forced the author to the publication of what might be termed his life-subject. There is almost an autobiographical interest in the pages.

The scope of the contents is hardly encompassed in the title because the appendix carries chapters upon: I. Telephone Attachment in Surgery; II. The Electro-Magnet as an Aid to Localization; III. Localization from a Single Photograph; IV. The Rectification of the Current Supplied to the X-Ray Tube; V. Rules for the Protection of X-Ray Operators; VI. Plates Illustrating Special Cases (from Stereoscopic X-Ray Photographs).

The body of the book carries the roentgen localization methods under the following chapter titles: III. X-Ray Stereoscopy; IV. Rapid X-Ray Localization; V. The Cross-Thread Method; VI. Precise Localization: Further Considerations; VII. Localization of Foreign Bodies in Eyeball and Orbit.

A most interesting chapter upon "Secondary Rays and X-Ray Protection" will recall many early arguments of roentgen neophytes who probably thought their unstudied experiments were about to disprove some of Roentgen's enunciations upon the physics of the unknown ray.

This book is recommended not only because it provides excellent chapters upon the title, but the variety of reliable *x*-ray information upon collateral subjects will prompt its use for study and reference. Would that there were other books by similarly gifted roentgenologists to test our ability to say pleasant things and force the use of a Thesaurus for a sufficiency of laudable adjectives.

MODERN MEDICINE AND SOME MODERN REMEDIES. By Thomas Bodley Scott, M.D. With a preface by Sir Lauder Brunton, Bart, F.R.S. Paul B. Hoeber, New York, 1916. Price $1.50 net.

As Sir Lauder Brunton says in his lengthy preface, "It is a most welcome occurrence when a man fully qualified to do so writes down the ripe experience of his life so as to help his fellow-workers, both general practitioners and consultants, who one and all may learn from him. It is most unfortunate that such men rarely write down the results of their experience, for they are too much engaged in their daily work while they are in practice, and instead of retiring early, so as to have a few years' leisure before they die, they are apt to work to the very last and die in harness. Few, if any, will rise from its perusal without knowing something of which they were previously ignorant; and if other men qualified like Dr. Scott will follow the example he has set, and write down results of their experience, the medical profession will gain greatly in knowledge and patients will benefit greatly by improvement in treatment."

This small volume is a tabloid arrangement of much modern medical theory and practice. The diction is refreshing and as gentle as the dear old gray-haired practitioner we believe the author to be. Dr. Scott does not claim to

be scientific, but one can easily imagine him as a sensible advisor who puts faith into his patients and brings comfort to the household of his sick. In his chapter upon the Internal Secretions he concludes: "Of the things, then, that we have spoken, this is the sum. The old Romans in their deep wisdom and insight recognized an unseen force that in our bodies was ever fighting the battle of health versus disease, of life versus death. This they called the 'Vis medicatrix naturæ.' Of this power until now we have known but little more than this happy name. Harvey's discovery of the circulation of the blood was an enormous advance, but was no solution of the mystery. But when we ponder on these internal glands, their secretions, which are essential to life itself, their intimate correlations and their extraordinary powers, we are tempted in the first flush of our enthusiasm to cry out, like St. Paul to the Athenians: 'That power, that vim, which ye ignorantly worship, that declare we unto you.' And yet, on deeper reflection, we come to feel that it is still not the power that we see, but only the Great Architect's marvelous mechanism; and so we become humble again."

One does not choose a book like this for study but rather to read and enjoy an aspect of medical practice that rarely gets into print. For the dog-days of August when we want to read lightly and ponder deeply, this little volume will prove a hormone to our medical introspections. You can stick it in your pocket along with Van Dyke or Thoreau and read it while waiting for the fish to bite.

SOME OBSERVATIONS ON THE OSSIFICATIONS OF THE BONES OF THE HAND. By J. W. Pryor, M.D., Professor of Anatomy and Physiology, University of Kentucky. From the Laboratory of Anatomy and Physiology. Bulletin of the University of Kentucky, Vol. VIII, No. 11, Nov., 1916. 67 pages, 29 roentgen illustrations.

Dr. Pryor presents a further study into the ossification of the bones of the hand and wrist. This Roentgen Anatomic Index of growth has received much attention and publicity through Prof. Rotch of Harvard University, but undoubtedly the patient analysis of 554 children by Dr. Pryor should place the honors of this study with the latter.

It is always difficult to provide a satisfactory review of a statistical study. It may suffice to record Dr. Pryor's conclusions to whet the interest of the reader enough to secure the original monograph. In his 554 cases, over 200 of which were under seven years of age, Pryor observed:

First: The process of ossification is inaugurated much sooner than hitherto supposed.

Second: The bones of the female ossify in advance of the male. This is measured first by days, then months, then years.

Third: The chronological order in which the bones of the carpus are ossified is different from that formerly supposed.

Fourth: The bones of the first child, as a rule, ossify sooner than those of subsequent children.

Fifth: Regardless of the variations (normal) the ossification is bilaterally symmetrical.

Sixth: The union of the epiphyses with the shaft takes place much sooner than formerly supposed.

Seventh: Variation in the ossification of the bones is a heritable trait.

Pryor's observations differ materially from the latest editions by Cunningham, Morris, Holden, Gray and Poland. The reviewer does not know whether these Bulletins from Dr. Pryor's Laboratory are for sale, but we would advise those interested in Anatomico-Roentgen studies to make every effort to obtain them.